Pall Corporation

Case Study

Performance Upgrade of Dry Gas Filter with Profile® Coreless Filter Cartridge

Application

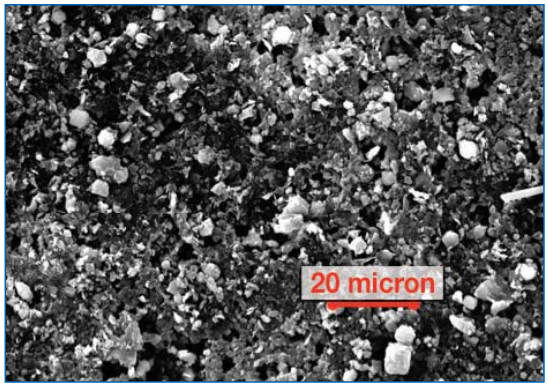
A Middle East gas processing plant operates a Natural Gas Liquids (NGL) recovery unit for the production of propane, butane and condensate. The feed gas is processed through a Molecular Sieve Dehydration Unit (MSDU), followed by a Mercury Removal Unit (MRU) and a Cold Box. The dehydration package contains a dry gas filter downstream of the driers, to remove molecular (mol) sieve fines in order to prevent the fouling of the MRU downstream.

It is normal that solid particles originating from the attrition of the mol sieve beads are released in the treated dried gas during the normal operation of driers. The particles are very fine, typically between 1-5 micron. Despite their small size, over a period of a year such contamination can actually represent significant volumes, which are detrimental to the equipment downstream. Therefore, they must be efficiently captured by the dry gas filter.

Problem

The dry gas filters supplied with the dehydration package were horizontal filter housings (duty/standby) equipped with 90 filter cartridges each. The cartridges were rated 1 micron at 98% removal efficiency as per the filter manufacturer. However, the plant reported fouling issues of the MRU and expressed concerns that a costly premature replacement of the adsorbent would be required again. In fact, in the past the plant experienced other major issues related to liquid carryover into the driers which had consequences in the MRU and the Cold Box that led to the replacement of the adsorbent in the MRU. At the request of the plant, Pall Scientific & Laboratory Services carried out online sampling at the dry gas filter inlet and outlet in order to assess the quantities of

solids in the treated gas. Field measurements confirmed that the dry gas leaving the driers contained fine particles mainly in the range of 1-20 micron, and highlighted that the filtered gas still contained significant amounts of particles between 1-5 micron, representing about 150 kg of solids per year carried over to the downstream MRU. The root cause of the fouling of the MRU was therefore attributed to the limited removal efficiency of the existing filter. Although the filter claimed a 1 micron removal rating, it did not provide an efficient protection of the MRU.



Microphotograph of fines recovered on a test membrane at the outlet of the existing filter

Solution

In order to enhance the protection of the MRU and as part of a debottlenecking project aimed at increasing the plant capacity to 1,350 MMSCFD, the plant decided to invest in a new dry gas filter. Pall Corporation was awarded the project. The new filter was installed in parallel of one of the existing filters, which remained on a bypass line. The filter was equipped with 63 Profile® Coreless filter cartridges, which use the proven Profile absolute-rated, depth graded pore filter media. This depth filter is particularly suited to capture fine particles within the tortuous fiber matrix. The Profile Coreless filter cartridge features a 1 micron absolute rating, as per the Sodium Chloride Aerosol Challenge test, derived from standard BS EN 13328-1. Filters that have a micron rating tested to a recognized standard are typically designated as 'absolute' filters. By contrast, filters with a micron rating that does not relate to any test methodology, or with no removal efficiency stated, are called 'nominal' filters. As a result, the use of an 'absolute' rated filter is key for critical filtration requirements, to ensure that the filter behavior is predictable and reproducible once operated in the field.

Operation feedback

The new 'Coreless' dry gas filter has been providing excellent protection of the MRU, which was confirmed by the steady pressure drop across the MRU. The 'Coreless' filter retained all solids released from the driers, even during upsets which led to a significant carryover of mol sieve fines and beads into the dry gas filter. The performance tests that were conducted at the request of the plant confirmed the excellent removal efficiency of the filter. The solids content in the filtered gas was significantly reduced, and represented a drop of over 30 times the amount of solids entering the MRU. The used 'Coreless' filter cartridges showed an efficient retention of the solid particles in the outer layers (upstream: grey) of the depth filter media, while the inner layers (downstream: white) remained clean.

Benefits

The performance upgrade of the dry gas filter enabled:

- A stable pressure drop across the MRU, to maintain the highest possible pressure at the Cold Box in order to maximize NGL recovery and plant revenue
- A stable plant operation, to minimize plant Opex by avoiding costly unscheduled shutdowns for the replacement of the adsorbent in the MRU

Conclusion

The use of 'absolute' rated filters is the key for critical filtration requirements. Filters designated as 'nominal' which feature a micron rating and a removal efficiency that are not well defined, are subject to solids carryover.

The technical specification of the dry gas filter should not be overlooked, as it usually protects another processing unit or equipment that is expensive and critical to production. Mol sieve fines are continuously released with the dry gas, and they should be efficiently captured because they are detrimental to operations. However, capturing the fines is difficult due to their very fine size. Absolute-rated filters should be used to achieve the highest filtration requirements, to maximize plant reliability and revenue.

PALL® Pall Corporation

Fuels and Chemicals

25 Harbor Park Drive
Port Washington, NY 11050
+1 516 484 3600 telephone
+1 888 873 7255 toll free US

Better Lives. Better Planet.SM

Visit us on the Web at www.pall.com

Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to www.pall.com/contact

Because of technological developments related to the products, systems, and/or services described herein, the data and procedures are subject to change without notice. Please consult your Pall representative or visit www.pall.com to verify that this information remains valid. Products in this document may be covered by one or more patent numbers. For a complete list of Pall's patents please visit http://www.pall.com/main/about-pall/patents.page